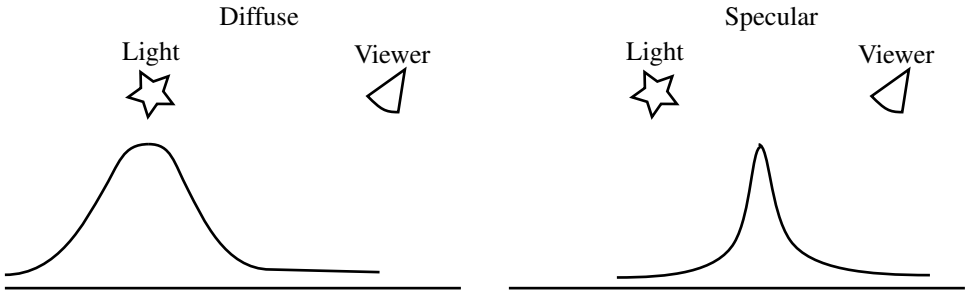
CS 559: Computer Graphics

Homework 5

This homework must be done individually. Submission date is Tuesday, November 19 in class.

Question 1:

Below are shown the illumination graphs for the diffuse and specular components of a flat surface lit by a light as shown with a viewer in the position indicated.



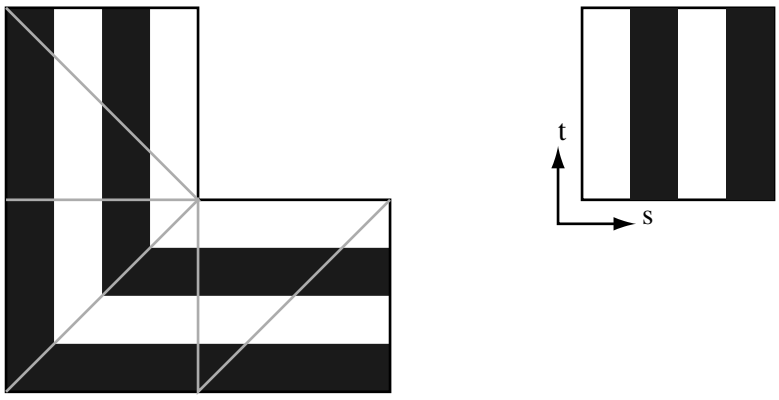
a. Draw two more graphs, one for the diffuse and one for the specular component of the same flat surface. However, now make the distant light assumption, using a directional light source coming from *vertically above.*

b. Draw two more graphs, but now make the distant viewer assumption, assuming that the viewer is looking from a constant direction *vertically down* to the surface. Use the point light from the original example, NOT a directional light.

c. Draw two more graphs, showing the effect of **both** a directional light coming from above and a distant viewer looking from above.

Question 2:

Consider the texture shown below on the left and the textured triangles on the right. The texture is to be repeated in both s and t. Give a set of texture coordinates that could be used for the vertices of the triangle mesh.

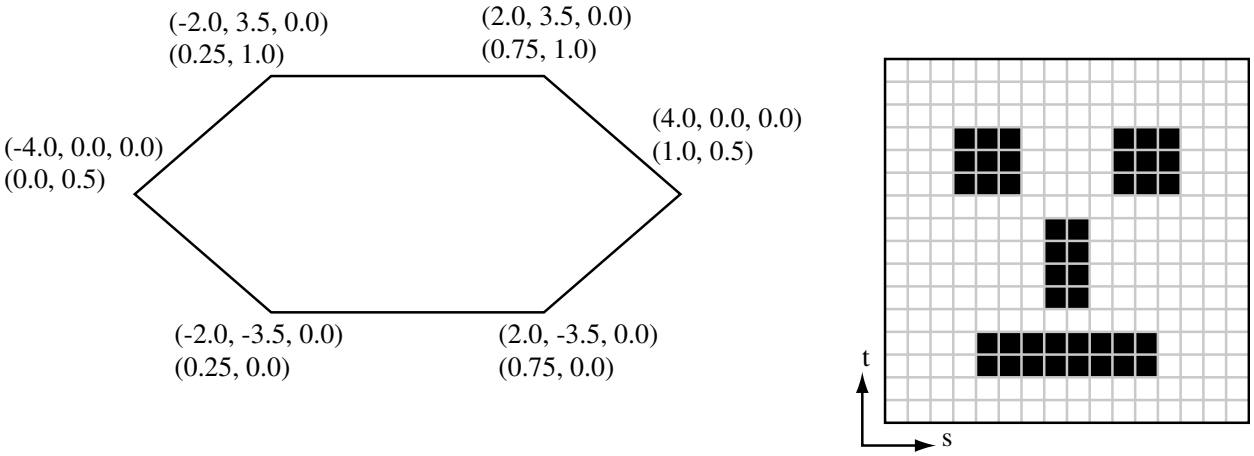


Question 3:

Sketch a texture that you would use for a brick wall. What format, repeat or clamp, would you use for the s dimension of the texture? Which would you use for the t dimension?

Question 4:

On the left is a polygon with both its world coordinates and texture coordinates marked. On the right is a 16×16 texture map that will be used with the polygon.



a. Draw the next twp mipmap levels for the texture, down to a 4×4 image. Indicate the intensity of each pixel in each mipmap, and assume the mipmaps are generated by averaging pixels.

b. The polygon is rendered with a perspective view looking toward the negative z axis with the positive y axis pointing up. The viewing and window parameters are such that, for the polygon, each unit of distance in world space appears as 2 pixel lengths on the screen. Which mipmap should be used for texturing the polygon? Show your working, and assume nearest_mipmap_nearest as the texture interpolation mode.